UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF PUBLIC ROADS AND RURAL ENGINEERING
Washington, D. C.

FIELD LETTER FOR SEPTEMBER
October 1, 1916.

No. 20.

DIVISION OF CONSTRUCTION
Vernon M. Peirce, Chief.

Advice and Inspection.

E. O. Hathaway, S. H. E., was relieved at Chester, South Carolina, on September 21, by H. K. Craig, H. E., the latter having finished his work of assisting the North Carolina State Highway Commission. Mr. Hathaway reported to the Office at Washington, and on September 23 left for his home at Nashua, New Hampshire, for a few days' leave.

W. H. Lynch, S. H. E., completed his assignment in Washoe County, Nevada, and on September 2 was assigned to prepare a report for a system of roads for Yuba County, California. His headquarters are at Marysville.

F. A. Davis, J. H. E., completed his work of cooperation with the County Engineer of Choctaw and McCurtain Counties, Oklahoma, and on September 13 proceeded to Waurika, Oklahoma, to assist the County Engineer of Jefferson County.

J. C. Wonders, S. H. E., finished the construction of the object-lesson road in Fillmore County, Nebraska, on September 18, and was assigned to cooperate with the State Road Bureau of West Virginia on work throughout that State.

Object-lesson Roads.

J. H. Dodge, S. R. C., completed the work of constructing a sand-clay object-lesson road in Morton County, North Dakota, and on September 25 proceeded to Bismarck, North Dakota, to construct an object-lesson road in Burleigh County.

J. W. Janssen, H. E., during September, assisted in designing timber bridges in the Office at Washington, and attended to preliminary details pending the award of a contract for the construction of an experimental sand-clay road in Prince William County, Virginia.

S. L. Taylor, J. H. E., completed the construction of the Mt. Vernon Experimental Road in Fairfax County, Virginia, on September 21, and was assigned to assist Mr. Moorefield on the Alexandria-Accotink Experimental Road

Post Roads.

On September 8, W. A. Crossland, S. H. E., was directed to turn over the work of preparing plans for a system of roads for Appling County, Georgia, to B. F. Heidel, S. H. E., and proceed to Dubuque, Iowa, to relieve C. H. Sweetser, S. H. E., in charge of the Iowa Post Road. Mr. Heidel finished the assignment in Appling County and returned to Atlanta to resume his work of investigating the road materials of Georgia. Mr. Sweetser arrived at the Washington Office September 18.

C. H. Moorefield, S. H. E., left his work of supervising the construction of an experimental road in Fairfax County, Virginia, on the night of September 28 to make a final inspection of the Ohio Post Road, which is now complete. After the inspection Mr. Moorefield will resume his assignment in Virginia.

P. A. Rideout, J. H. E., in charge of the North Carolina Post Road, has moved his headquarters to Black Mountain.

DIVISION OF MAINTENANCE
E. W. James, Chief.

Inspection, Advice and Lectures.

W. L. Spoon, S. H. E., attended Board meetings at Graham, Hillsboro and Durham, N. C. September 4, and on September 28 and 29 he inspected the Saxapaw Road, which is to become part of the Central Highway.

Mr. James attended the Annual Convention of the Southern Appalachian Good Roads Association at Lexington, Ky. September 6 and 7, and delivered two addresses on the "Operations under the Federal Aid Road Act" and "The Cost of a Road." On the 8th, he conferred with Rodman Wiley, of the State Highway Department at Frankfort, Ky., regarding proposed Federal Aid roads in Kentucky.

September 9, Mr. James visited Wise County, Va., inspected the bituminous work under construction and maintenance there and advised the Commissioner and Engineer regarding the maintenance of surface treated work near Big Stone Gap.

September 17, Mr. James was at Norfolk, inspected the shell deposits there and secured samples for tests. On the 18th, he visited Augusta, Georgia, and Aiken, S. C., regarding the proposed maintenance of the Aiken South Carolina Post Road, and on the 19th, attended the organization meeting of the new State Highway Department of Georgia where he addressed the Commissioners regarding proposed operations under the law.

D. H. Winslow, S. R. C., delivered a lecture at Oxford, N. C. September 7 on "Granville County Roads." On the 22nd he attended a popular meeting at South Hill, Va., and on the 27th he delivered a lecture in Henderson, Vance Co., N. C.

G. C. Scales, S. H. E., was present at the organization meeting of the Georgia Highway Department in Atlanta, September 19.

WASHINGTON-ATLANTA HIGHWAY.

Nottaway County, Va. signed for $60 per mile on 14 miles of road Aug. 16, 1915. Work began September 1, 1915, and on Sept. 1, 1916, $434.12 had been spent for maintenance, or practically $31 per mile.

Lunenburg Co., Va., which has formerly worked under the squad system, has been so well pleased with the patrol work on the Washington-Atlanta Highway, that a general change will be put in force on all improved roads.

V. E. Towles, H. E., is preparing a report on the failure of the Highway bridge over the Wateree River at Camden. A ferry boat 60 x 16 feet is now operating on the Wateree River at Camden, accommodating all classes of traffic. A toll of fifty cents is charged for autos.

Mr. Towles reports that repairs were completed Sept. 7 on the dam at Ingrams Mill so that the road now is open to traffic as far as the Wateree River.

V. E. Towles, H. E., inspected the road from Smithfield to Four Oaks, Johnston Co., N. C. Sept. 14, and attended a meeting of the Road Board at Ingram Township.

CENTRAL HIGHWAY.

Wayne Co., N. C., has completed one more mile of new location eastward toward LaGrange.

The entire section west of Goldsboro has been machined and widened.

Alamance Co. roads, built five years ago, and having had no proper maintenance since, have been placed in such good condition under systematic maintenance work introduced by W. L. Spoon, that they are attracting attention in the county.

A section of the post road in Iredell Co., 13 miles east of Statesville, has been recovered with top-soil.

Boon Hill Township will sell $40,000 worth of bonds at auction October 2. The proceeds will go on the Central Highway.

Lenoir County has let approximately 56,000 cubic yards of grading at twenty-three cents per cubic yard to a contractor at Durham. This work will be done over the Neuse River bottoms.

GENERAL HIGHWAY.

Craven Co. has completed the road signs and color scheme across the county. Tarvia surface treatment on gravel is being placed east of New Bern, and a convict gang is grading and widening the road east of Pine Grove and Havelock.

FIELD EXPERIMENTS.

Materials are on hand for retreating sections 1 and 3 of the Falls Road. Work will be begun at the earliest possible date. Materials are on the ground for the retreatment of the concrete sections of North Kensington Road.

Sections 1 and 2 of the Department grounds have been treated with cold Ugite and Trinidad Road oil respectively, and materials are ordered for sections 3 and 4.

Bids have been asked on materials for that part of Section 1 of the Rockville Pike between Bradley Lane and Bethesda. These retreatments will complete the work planned for this season.

The Russell Road, Alexandria Co., Va., is now being posted with section signs indicating the various experiments, and J. H. Eldridge, S. R. C., has added it to the list of roads in his charge.

NATIONAL PARK AND FOREST ROADS
T. Warren Allen, Chief.

Projects:

District No. 2 - A. E. Palen in charge.

Rabbit Ear Pass:

Construction is progressing slowly on account of the lack of labor and teams which are being used for harvesting and haying. Resignation of the resident engineer Sept. 5, compelled the highway engineer to spend several days of the first half of September reestablishing and revising surveys and sections so that the foreman in charge, who was the resident engineer last season, could handle it with his other duties. The whole of one mile, No. 17, has developed 50% to 75% loose rock covered and imbedded in adobe clay, where the location survey classified earth. This increases the cost of the mile 50% and inconveniences the financing of the project for completion. It would seem advisable to call for more careful classification, that is, to a point of digging of test pits at intervals often enough to determine the various types of geologic and topographic conditions encountered. There remains 1.4 mile to construct before Nov. 1 which will complete the project between Forest boundaries on that undertaken by the 10% Fund. An application has been received to construct 3 miles on the west end under the Federal Aid Act which will connect this road to the main system in the Bear River Valley near Steamboat Springs.

Durango-Silverton: Location surveys on the most difficult portions of the route are progressing at about a mile per week. The party consists of the chief of party and location, a transit man, 2 chain men and a cook, the latter of which provides the stakes from nearby dead standing timber.

Sedalia-Decker Springs: The expensive maintenance on this project has developed the necessity for means of protection to the inside ditches.. This road was constructed under the 3rd class having grades of 10% and a width of 14 ft Much of the road lies in disintegrated granite containing very little binder and is subject to excessive wash on grades above 7%. Breakers of 3" plank are to be placed in the ditches at intervals of 35 feet on grades above 9% and 50 feet above 7%. This road is but 20% constructed and has been carrying quite heavy travel considering the difficulties of a narrow and crooked road on the remaining 80% of the distance.

District No. 3. O. N. Powell in charge.

During the month, Mr. Powell made an inspection of the Panchuela-Gloriata road in the Santa Fe Forest, New Mexico. The work which had been delayed considerably, due to the failure of the contractor to deliver equipment, is now well under way. About half a mile of road was completed in September.

Progress on the Salt River Pleasant Valley road in the Tonto Forest, Arizona, is slow, owing to trouble in getting supplies.

The Winslow-Long Valley road in the Coconino Forest, Arizona, is going on satisfactorily, except for some labor trouble. Men are being paid $3.00 per day, and teams are costing $6.00, but a higher price is demanded for teams on account of the difficulty of securing hay and grain.

District No. 4 C. H. Kendall in charge.

In the Kaibab National Forest, Arizona, severe storms have caused considerable erosion and injury to sections of the Grand Canyon Highway, and an allotment of $1,000 has been made for the necessary repairs.

7,000 feet of new grade has been completed upon the Ephraim-Orangeville road, Manti National Forest in San Pete County, Utah, and the heavy work done. 4,500 feet of grading remains to be done in October to complete the seven mile section contemplated for this season's work.

The 7,800 feet of clearing and grubbing and 9,700 feet of grading upon the Kamas-Stockmore road, Uinta National Forest, have been completed to Wolf Creek Summit, and the new road is now open to the public to that point. Another section of about 3,000 feet of heavy grading around Bear Camp hill, six and one-half miles east of the summit, will be completed in October, thus permitting through travel over the twenty-one miles of Forest road with a maximum grade of 8 per cent over the 9,500 foot summit. With the improvement of six miles of old road, now in use, this project will be completed next season.

Upon the Helper-Duchesne road, Uinta National Forest, arrangements have been made for the improvement of a four and one-half mile section of the road down Indian Canyon, using the State construction crew which has just completed a 30,000 foot section adjacent to the Forest in Duchesne county.

In Idaho, upon the South Fork Payette River road, construction work has been begun on the three mile section between Deadwood and Lowman. Work

will be conducted with the cooperation of ranger labor this fall and winter. This road, from Garden Valley to Deadwood, is under the continual maintenance care of a man with a team and his work has been very effective.

In Wyoming, upon the Teton Pass Road, on the west side of the summit, 6,000 feet of new grade was completed in September. There remains about 8,000 feet of grading to be done to reach the summit, clearing and grubbing have been completed, and slope stakes are being set.

Preliminary location of the survey of the Cedar Canyon road to Midway, in the Sevier National Forest, Utah, has been completed over the twelve mile section, four and one-half miles being without the Forest and for the State. This project has been applied for under Federal Aid Road Act, Sec. 8.

Considerable time has been devoted in the office to assisting in the preparation of data for the application for projects in the District under Sec. 8. Conferences have been held with State officials of Idaho and Utah, and field inspection trips made upon some of the projects.

District No. 5. C. C. Morris in charge.

Trinity River Road: This road was completed to Mile 7½ and work was in progress to Mile 8. The work in July, August and September was in steep country and cost about $9,000.00 per mile for the twelve foot road. An air compressor plant was in operation in those sections where drilling was required and proved an undoubted economy in moving rock.

Salmon River Road: This project which is being financed in cooperation with Siskiyou County, California, was completed to Mile 3½ and work was in progress to Mile 4, which point will mark the end of the season's work.

At the end of the month the location survey was out to Mile 17.

Both the above projects were visited by Chief Engineer Merrill, Chief of Operation Adams, and District Forester DuBois.

District No. 6. B. J. Finch in charge.

The office work in District 6 has been mainly on correspondence and weekly reports, with much time taken up by matters relating to the Federal Aid Road Act. Many conferences are being held with State and County officials, and representatives of commercial clubs, who desire information regarding the provisions of the Act, or, as in the case of the State Highway Commission of Washington, desire to outline proposals for cooperation between the local authorities and the Department of Agriculture. Applications are being received for roads to be constructed under the first year's appropriation.

On the McKenzie River Road, in the Cascade National Forest, about three-fourths mile of road was completed. Work is progressing very satisfactorily and the reports secured will give sufficient information for ascertaining any cost data required.

On the Blewett Pass Road, in the Wenatchee National Forest, work is continuing on the section north of the Pass, in Chelan County. An additional allotment of $6,300 has been made for the section of this road south of the Pass in Kittitas County and work on this section, about one and a half miles, is expected to be completed before winter.

Location surveys for the season have been completed and the survey party has been broken up into two smaller parties doing reconnaissance survey work, one in the Olympic National Forest and the other in the Whitman National Forest. These reconnaissance surveys are on projects which may be constructed under the 10% Fund or, if applications are received, may come under Section 8 of the Federal Aid Road Act. The location surveys for the season cover approximately 29 miles. Cost data on these surveys are in this office but not yet compiled.

Franklin County, Idaho, work. T. C. Peterson in charge.

Mr. Peterson was on annual leave Aug. 31 to Sept. 13.

No field work was done in September. In the office the coordinates were calculated for the transit lines of the Preston-Bonida, Preston-Treasureton and Preston-Mink Creek Roads. The cross-sections for the Preston-Mink road has been plotted and the plotting of the cross-sections of the other two roads will be completed soon. This has been a very dry season and with the heavy traffic over the roads many of them have rutted badly, especially where not graveled. As soon as the fall rains have moistened the ground sufficiently the roads constructed this season will be reshaped and surfaced with gravel and oil shale.

Medford-Crater Lake Highway Survey.

The field work on this survey was begun May 15, and completed on August 25. There were sixty-seven and one-half miles of the main line and one and nine-tenths miles of secondary lines. For actual days worked this makes an average of forty-two stations per day.

Following are detailed reports of the cost and cost of subsistence, inclusive of August 31.

During the month of September work in completing the plans has been carried on in an office at Trail, Oregon. At the present time there are four assistantdraftsmen in the office.

COST - MEDFORD-CRATER LAKE HIGHWAY SURVEY.

Item	May				June			
	Stations Surveyed	Cost	Unit cost	Cost per Mile	Stations Surveyed	Cost	Unit cost	Cost per Mile
Base line of survey	737	$306.72	$.417	$21.95	1126	$504.79	$.448	$23.62
Levels and cross-sections	730	229.12	.314	16.58	970	273.85	.282	14.90
Work on Plans (incomplete)	730	288.72	.395	21.50	970	145.05	.150	7.80

Item	July				August			
	Stations Surveyed	Cost	Unit Cost	Cost per Mile	Stations Surveyed	Cost	Unit Cost	Cost per Mile
Base line of survey	832	$466.95	$.361	$29.60	968	$510.57	$.528	$27.90
Levels and cross-sections	924	269.48	.282	15.90	1039	238.77	.231	12.20
Work on Plans (incomplete)	945	171.60	.182	9.60	1018	164.32	.162	8.55

Item	Total Stations	Total cost	Unit Cost	Cost per Mile
Base line of survey	3663	$1789.03	$0.488	$25.80
Levels and cross-sections	3663	1011.22	0.276	14.60
Work on Plans (incomplete)	3663	769.69	0.210	11.10
Moving camp		72.08		
Total		3642.02	0.995	52.50
Field work(base line of survey, levels and cross-sections and moving camp).....		2872.33	0.784	41.40

The above costs are exclusive of the charges to the Office of Public Roads and Rural Engineering.

Party organization and salaries:

Chief of full party - From Office of Public Roads and Rural Engineering.

Base Line Party:

1 Transitman, $125.00 per month and subsistence
1 Rodman, $75,00 per month and subsistence
1 Head chainman, $50.00 per month and subsistence
1 Rear chainman, $40.00 per month and subsistence
2 Axemen, $40.00 per month and subsistence

Level and Cross-Section Party:

1 Levelman, $85.00 per month and subsistence
1 Rodman, $40.00 per month and subsistence
1 Axeman, $40.00 per month and subsistence

Office:

1 Draftsman, $90.00 per month and subsistence

Camp:

1 Cook, $50.00 per month and subsistence
1 Camp assistant and packer, $60.00 per month and subsistence.

The Work:

The base line party ran the transit line, made the land corner ties and at times assisted with the cross-sections.

The level party established bench marks at intervals of about 1000 feet, checked these elevations by profile levels and took cross-sections.

The draftsman kept the transit line, profile and cross-sections plotted, and in some places established a trial grade line.

The camp assistant aided the chief with the buying and securing of supplies, did the routine camp work, handled the moving of camp, and at times worked as an axeman on the line.

The cook did the cooking, cut his own wood and assisted in moving the camp.

At most times county road supervisors provided teamsters for moving camp.

Rations.

Article	Unit	Amount Used	Cost	Ration Used One man one day	Recommended Ration
Fresh meat	Pounds	621	$96.68	.536	.70
Cured "	"	423½	90.02	.365	.30
Lard	"	165	24.55	.142	.14
Flour	"	825	22.65	.711	.70
Corn Meal	"	38	1.10	.033	.05
Baking Powder	"	10	.97	.0086	.02
Sugar	"	402	34.70	.347	.35
Coffee	"	44	10.15	.038	.05
Tea	"	5	1.28	.0043	.008
Butter	"	160½	49.12	.142	.14
Dried fruit	"	104½	11.03	.090	.10
Rice, beans or hominy	"	96½	7.14	.083	.10
Potatoes	"	1152	28.12	.994	1.00
Salt	"	48	.92	.041	.04
Flav. Extracts	Ounces	40	2.10	.034	.03
Spices	"	60	1.09	.052	.05
Milk, condensed	Cans	248	18.30	.535	.40
" fresh (used separately)	Quarts	248	16.38	.356	.40
Canned fruit	Cans	214	32.30	.185	.18
Vegetables, canned	"	186	17.80	.160	.15
" fresh (used together)	Pounds	597	27.70	.515	.50
Syrup	Quarts	56	17.25	.048	.05
Pickles	"	35	4.37	.030	.03
Vinegar	"	13	1.00	.011	.015
Onions	Pounds	50	2.03	.043	.05
Eggs	Dozen	248	60.06	.214	No. 2½
Breakfast foods	Pounds	101	5.13	.087	.08
Miscellaneous	-	-	11.12	Dollar .010	Dollar .015
Total cost of subsistence supplies.....			595.05		
Transportation of " "			90.00		
Salary of Cook			170.98		
Total cost of soap, gold dust, sapolio, matches, oil, and wood.....			11.85		
Total cost of subsistence.....			867.89		
Total number of rations served, (one ration equals one man one day).....			1160		
Cost of each ration.....			.748		

Notes:

Due to the fact that most of the subsistence supplies were brought to camp in the automobile kept in camp, the transportation charge is an estimate only. It is placed at the maximum.

Breakfast foods could be charged under corn meal, thus making the usual ration of about 0.10 lb., but due to the difference in cost, the separation seems advisable.

The ration for milk is for either fresh or condensed used separately and not together; while for vegetables, it is for a combination of fresh and canned vegetables.

Under miscellaneous are included, crackers, yeast, chili powder, soda, salad oil, catsup, chocolate, lemons, tooth picks, etc. An allowance of $1\frac{1}{2}$ cents per ration should supply these items easily.

Division of Road Material Tests and Research.

Prevost Hubbard, Chief.

Projects.

Administration.

J. R. Boyd, Student Assistant, formerly with the Division of Rural Engineering, has been transferred to the Division of Road Material Tests and Research and promoted to the position of Laboratory Apprentice to assist Mr. Goldbeck in concrete investigations. His new appointment takes effect October first.

Routine Tests and Analyses.

In September 74 samples of bituminous material were examined in the Chemical Laboratory, of which 23 were of bituminous gravel mix used in the construction of the Alexandria-Accotink Experimental Road. Eighty-five samples of rock, sand, gravel, etc., were examined in the Physical Laboratory, and 51 examined and classified in the Microscopic Laboratory.

Research Upon the Properties of Dust Preventives and Road Binders.

An experimental topping plant was designed and partially installed in the refining plant at Arlington Farm. It is expected that this plant will be tried out early in October.

A number of the new instruments designed in the Office for the purpose of determining the consistency of fluid bituminous materials were accurately made in the Bureau of Standards and an investigation of their range and applicability is now under way in the laboratory.

Date is being collected for the publication of a paper dealing with the thickness of films of bituminous materials upon various types of mineral aggregates

Nonbituminous Road Material Investigations.

In order to hasten the investigation regarding the standardization of an abrasion test for gravel, which has been delayed by the large amount of routine work, it is planned to install a new abrasion machine in the Physical Laboratory and to detail a man solely upon this line of work.

A machine has been designed for washing laboratory samples of sand and gravel and will be constructed soon. It will be in the form of a cube concrete mixer of about one cubic foot capacity and, it is believed, will overcome several of the difficulties which have been encountered in the operation of the machine now in use.

Considerable additional work has been done in connection with the determination of the relation between the mechanical analysis of sands and the tensile strength of mortar, also a standard method of determining the normal consistency of sand mortars.

A number of additional sections of brick pavement have been tested under the large impact machine, which confirm the results outlined in the August field letter. In addition, two sections of pavement grouted with an asphalt filler were tested. In both of these sections the centre brick broke without destroying the bond between the other bricks in the section. The height of blow at failure of these two sections was about the same as when cement grout was used. The rebound of the hammer, however, was much smaller, showing only about $1\frac{1}{2}$ in. as against 2.7 in. where the cement grout had been used.

The Abram method of determining the amount of organic matter in sand by colorimetric means is being studied and the results so far obtained show that the color value of the sand, as determined by the proposed method, is directly proportional to the percentage of loam which is added.

Experimental Bituminous Road Construction And Maintenance.

Mr. Kamrass has been engaged throughout the month as plant inspector in cooperation with Mr. Moorefield on the Alexandria-Accotink Experimental Road. During the absence of Mr. Moorefield for a few days, Mr. Anderton took charge of the construction of this road. It is felt that the careful inspection given will develop the maximum value which can be obtained from a bituminous gravel concrete road constructed of gravel available in this vicinity. The analytical data is being tabulated daily and is open to inspection in Mr. Reeve's office to all engineers who are interested in the construction of this section.

Concrete Investigations.

A small slab of 6 foot span, 12 foot width and 5 in. effective depth was tested and a new slab of 12 foot span, 6 foot width and 4 in. effective depth has been prepared and placed for test. This slab will be tested for the influence of span on effective width.

Messrs. Goldbeck and Jackson are still engaged in the preparation of a bulletin on the expansion and contraction of concrete, which it is expected will be finished early in October.

Soil Pressure Investigations.

A large number of soil-pressure disks are in process of construction and it is expected that a number will be installed for October.

DIVISION OF ROAD ECONOMICS.

J. E. Pennybacker, Chief.

Statistical Investigations.

Bulletin No. 386 on Public Road Mileage and Revenues in the Middle Atlantic States, 1914, was issued on September 11. A similar bulletin for the New England States and another for the Southern States are in the hands of the printer. The bulletin for the Western States and a summary of the four bulletins are now about ready for the printer. Circular No. 63, State Highway Mileage and Expenditures, 1915, is announced for issue October 2.

Lectures and Road Models.

L. E. Boykin attended the State Fair at Louisville, Kentucky, September 11, 1916, to install and demonstrate a set of road models.

W. E. Rosengarten was assigned to install and demonstrate road models at the State Fair, Syracuse, New York, September 11, 1916, and also at the Chautauqua County Grange Golden Jubilee, Ashville, New York, the week of September 18.

Road models were displayed also at the Southern Appalachian Good Roads Congress, Lexington, Kentucky, September 5-8, and at the Western Pennsylvania Exposition Society in Pittsburgh. The models on display at Pittsburgh will remain there until October 14.

Dr. L. I. Hewes delivered a lecture Sept. 13 at South Weymouth, Massachusetts, before the Board of Trade.

Economic Post Road Studies.

W. E. Rosengarten is making the final study on the Maine post road.

Convict Labor.

H. S. Fairbank has been assisting the State Highway Department of Arizona in establishing state convict road camps.

The experiment in economic management of the convict labor camp in Fulton County, Georgia, has been concluded and R. F. Eastham, who was in charge, has returned to the Office.

Bulletin No. 414 on Convict Labor for Road Work has passed the galley proof stage and should, therefore, be available within a few weeks. Work is now under way on a publication which will set forth the results obtained at the experimental convict camp in Fulton County, Georgia.

Economic Studies.

Bulletin No. 393 on Economic Studies of the Effect of Road Improvement in Eight Selected Counties, was returned in page proof form Sept. 18 and may, therefore, be expected for distribution at any time. Work is progressing on the series of bulletins descriptive of state highway work and it is expected that the manuscript of the first of the series, dealing with order and procedure of state highway work, will be ready for the printer some time in November.

DIVISION OF RURAL ENGINEERING.

E. B. McCormick, Chief.

Domestic Water Supply and Sewage Disposal.

Provisional designs, with leading dimensions, have been made for two hydraulic ram installations and one sewage disposal plant.

On September 14, G. M. Warren, Hyd. E., gave a talk, illustrated with lantern slides, on "Farm Community Water Supply and Sewage Disposal," before the Clarendon, Virginia, Citizens Association.

Farm Structures.

Drawings for the combined sheep barn and laboratory to be built of reinforced concrete at the Beltsville Experiment Farm are nearly ready for tracing. The roofing is something of an innovation. It consists of reinforced concrete arches, braced laterally with concrete purlins; a metal roof is to be laid over the whole.

The drawings have been completed for a third cottage for the Iberia Experiment Farm.

The contract has been awarded for the hog pens designed sometime ago by this Office for the Bureau of Animal Industry. These pens are for use in making experiments in individual feeding of hogs and are so designed that each animal is automatically locked into a separate pen and held until the feed for all the animals has been placed before them. The feed is then made accessible simultaneously. After all are fed, they are released by a device which operates all gates at once.

Thresher Explosions.

Elmer Johnson, A.M.E., has returned to Washington, having completed the actual field demonstrations of the fire extinguishing apparatus in the Northwest. On his way east he stopped off at the University of Nebraska, Kansas Agricultural College, and Iowa State Agricultural College, conferring with certain members of the faculty regarding rural engineering work in general.

Rural Engineering Problems Involving Mechanical Principles.

Judging from the increased number of requests, the question of farm electric lighting plants is beginning to awaken considerable interest throughout the country. Requests for assistance in the construction and remodeling of ice houses, the installation of house heating plants, lighting plants, and various other matters have received attention.

DIVISION OF IRRIGATION INVESTIGATIONS

Samuel Fortier, Chief.

Administration.

The chief of the division has spent the summer visiting the localities where irrigation work is in progress and conferring with the members of the field force regarding both the present and future activities of the division.

New Jersey was the first field visited and notwithstanding the apparent abundance of rain, most of the irrigation plants were being operated. George A. Mitchell, the agent in charge, states there are more than 275 such plants in the State. This radical change in farm practice in New Jersey is indicative of what has taken place in less than a decade throughout the Atlantic Coast states from Maine to Florida and of the far-reaching influence exerted by this Office in introducing, in the East, modified forms of western irrigation practice. Much yet remains to be done in standardizing and improving methods, lessening the first cost of installations and in utilizing to a much greater extent than has hitherto been done, the available flow of surface streams.

Cooperation in Colorado, through the Agricultural College & Experiment Station, is progressing satisfactorily. The state contributes about $6000 a year to the joint fund and the work comprises the following main features: (1) A continuation of experiments conducted at the hydraulic laboratory, consisting of a series of tests on orifices, divisors, Venturi flumes, reservoir outlets, and current meters; (2) a broad, general study of the use of water throughout the Cache la Poudre valley in northern Colorado; and (3) the design and construction of drainage systems for the Grand Junction Indian school, the Arkansas valley and for other districts throughout the State.

This year the greater part of the available funds is being expended on the Cache la Poudre valley investigation. This Valley includes approximately 275,000 acres of irrigated land which is supplied with water by fifty canal systems and 60 storage reservoirs. In the course of 35 years the enterprising farmers of this community have transformed a worthless desert into highly productive farms with little or no assistance from either the State or Federal Governments. In the progress made by these farmers can readily be traced a gradual evolution in the use of water in irrigation. As a result of repeated trials and many failures these pioneers have evolved methods, customs, and regulations which in their estimation are well adapted to their conditions and needs. It is the purpose of this investigation to study the manner in which water is used in this part of Colorado with a view to recommending its good features to other communities which are about to begin a similar task of desert land reclamation. About the only criticism that can be made justly against the Colorado cooperative work is that too much has been attempted for the men and money available. This could not well be avoided since the district which is being studied could not well be divided. V. M. Cone, I. E., in charge of the Colorado cooperative work, has applied the only remedy possible under the circumstances in the efficient organization of his staff and subjecting each worker to long periods of labor each day.

R. B. Sleight, A. I. E., in charge of the field laboratory at Denver, Colorado, is securing valuable results from tank installations which should throw considerable light on the loss of water by evaporation from shallow stream beds like those of the Platte and Arkansas rivers and also on the difference between the rate of evaporation from water surfaces in tanks of varying diameters and depths. On the whole, the Denver laboratory is proving a valuable aid in determining some of the principles which underlie the practice of irrigation.

The State of Wyoming has cooperated for eleven years with this division but at the close of the state fiscal year, March 31, 1916, Governor Kendrick terminated this cooperation, largely on the plea of economy. The work which was begun as a cooperative undertaking in the spring of 1915, is being continued under the direction of J. T. Kingdon, I. E., and consists chiefly in an investigation of the operation of the Wyoming irrigation law from the standpoint of the water user. The results thus far secured show the need of certain modifications of existing laws, customs and regulations relating to water and more particularly freeing state administrative officers, who are charged with the duty of controlling and subdividing the public waters, from all influence exerted by party or State politics.

For a number of years assistance has been given to the irrigators living on that part of the Great Plains area included in the western portions of the Dakotas, Nebraska, and Kansas. This part of the West is unique, in that it is located on the border line between a humid and an arid climate. In dry years irrigation water is much in demand and a general interest is aroused in promoting this industry. On the other hand, in wet years irrigation plants and canal systems are not fully utilized and interest wanes in this means of development. The Great Plains area is unique in another respect. The irrigators of the bordering and more elevated states to the West divert practically all of the summer flow of interstate streams, thus leaving, for the most part, dry river channels in the territory to the east. In consequence the chief available water supply for the farmers of the Great Plains area is derived from the underflow of rivers and valleys. This underflow, the best manner of digging wells and the most efficient methods of

raising the ground water to the surface, involve a knowledge of engineering which few farmers possess. For a number of years H. C. Diesem, I. E., has been devoting much of his time to these problems and one of the chief obstacles which he has had to overcome is in counteracting the efforts of unscrupulous sales agents in selling inferior or unsuitable equipment to farmers. In order to safeguard the interests of those who intend to install pumping plants, it was suggested that Mr. Diesem and his assistants supervise the design, construction and installation of at least one plant in each community, such plant to serve as a sort of model for others to imitate, and this procedure has been approved by the Office.

It has been demonstrated amply that the farms of the Great Plains area which are underlaid by a stratum of water-bearing sand and gravel within an economical lift of the surface, possess a valuable asset and as time goes on the value of this available water supply will be greatly enhanced. Furthermore, owing to the scarcity of water in this region, every effort should be made to economize in its use. It is not a question of securing maximum yields of crops by means of heavy irrigations, but rather of saving a crop from the effects of drought through the application of a little water.

The economical use of water derived from a deep well pumping plant at Garden City, Kansas is being carefully studied in cooperation with the Kansas Experiment Station. Sugar beets grown in a soil which contains a moisture content of 16% are far superior to those grown in a soil containing only 12% moisture. In like manner various other crops are being subjected to similar tests regarding moisture content which range from the wilting point to a water content in excess of the requirements of the plants.

In Utah, a concerted effort is being made to remedy some of the defects attendant upon irrigation development created by farmers possessing limited means. From the days of 1847 to the present, the waters of Utah streams have been diverted and canal systems built as necessity demanded, but without the exercise of much forethought as to the ultimate outcome of such a multiplicity of independent systems upon the general welfare of the community or the State. It is now apparent that such haphazard development can not go on much longer and that a reconstruction period must ensue if the chief agricultural resources of the State are to be utilized to anything like their fullest extent. In many cases part of the lands under the earlier water rights is so saturated with water as to be fit only for pasturage. It is likewise true that raw lands in the immediate vicinity are non-productive for the lack of water. In such cases the problem is to find a way which will satisfy both the legal and the physical requirements to transfer the excess of water from the wet to the dry lands. In other cases, a large number of small ditches divert water from one stream whereas, if the many could be combined into a few, a large gain would be effected in lessened charges for maintenance and operation and a greatly increased volume of water available owing to the decrease in transmission losses. This work of reorganization and of reconstruction is being carried out by L. M. Winsor, in addition to his other duties. In the vicinity of Beaver City, Utah, three individually-owned drainage systems have been installed, draining an area of 500 acres of water-logged meadow lands and thereby developing about 8 second-feet of drainage water which is conducted through a new canal to virgin soil on which profitable crops are being grown this season.

The conditions found in the remainder of the states visited will be reported in the next monthly letter.

Pumping.

H. C. Diesem, I. E., has been authorized to attend the Kansas Irrigation Congress held at Larned, and present a paper on pumping for irrigation.

P. E. Fuller, I. E., has been assigned to the duty of preparing for the Yearbook a paper on pumping water for irrigation on the farm. It is expected that this paper will be completed early in October.

Appliances and Equipment for Irrigation.

F. W. Stanley, I. E., is installing equipment at the Arlington Farm for testing reinforced pipes of various kinds for use under pressure in spray irrigation systems and for main pipe lines in surface irrigation systems. Iron pipe, in the large sizes necessary for main lines, is very expensive, and it is hoped that it will be possible to develop much less costly pipe which will serve equally well.

With the approach of the closing season for field work, all field agents are urgently requested to forward to our office at Berkeley, Cal. (c/o E. J. Hoff) all instruments that need attention (repairs, cleaning, rating, or adjusting) as well as all other instruments that are not likely to be used next season at their present stations. The former practice of agents - to retain as many instruments as possible merely for the purpose of securing an ample supply - has led to endless and useless correspondence, waste of time, and in many cases expenditure, as well as losses of instruments. With instruments of known qualities on hand, distribution of instruments becomes easier and more satisfactory.

Utilization of Water.

M. R. Lewis, A. I. E., in charge of the Twin Falls Experiment Farm, has submitted a report of the results of the work of the farm on the irrigation of grain, and this has been approved by the Secretary for publication in the local press.

Flow of Water.

F. C. Scobey, I. E., and P. A. Ewing, A. I. E., who have spent the summer in field work on the flow of water in concrete pipe, completed their field work and were expected here about October 1.

DRAINAGE INVESTIGATIONS
S. H. McCrory, Chief.

Supervision.

During the first ten days of September, S. H. McCrory, Chief, conferred with parties at Bemidji, Minn., regarding the drainage of Red Lake, and with parties at Fargo, N. D., regarding the prevention of overflow from Red River. He arranged for securing run-off measurements in north Minnesota, by cooperation with local engineers. He conferred with H. S. Yohe, expert in drainage organization,

at Chicago; with dealers in drainage bonds at St. Louis; with O. G. Baxter, S. D. E., at Little Rock; and with C. W. Okey, S. D. E., and Lewis A. Jones, S. D. E., at New Orleans, and with them visiting drainage pumping plants in south Louisiana.

Farm Drainage.

Charles Levy of New York has been appointed junior drainage engineer, and is assisting D. L. Yarnell, S. D. E., in the experimental work at Arlington Farm, Va.

Field work in West Virginia occupied Fred F. Shafer, D. E., practically the whole month.

Addresses at farmers' meetings were made by O. G. Baxter, S. D. E., at Newark, Desba, and Batesville, in Independence Co., Ark.

On the Cotton Valley Farm at Tarboro, N. C., H. M. Lynde, S. D. E., has staked out experimental drains and is installing weirs to measure the discharge from the tile drains.

Reports transmitted:

J. E. Wannamaker farm, St. Matthews, S. C., by F. G. Eason, S. D. E.
L. W. E. DiGhilini farm, Summerville, S. C., " " "
G. W. Holland farm, Eastville, Va., by W. N. Hall, D. E.

Reports received:

P. W. Tankard farm, Franktown, Va., by W. N. Hall, D. E.

Overflowed Lands.

S. W. Frescoln, D. E., has begun a survey of the proposed Beaver Dam Creek Drainage District in Clarke, Oglethorpe, and Madison Counties, Georgia.

Guy A. Hart, J. D. E., has been assisting on the Saginaw River investigation in Michigan, during September.

Computations for the report on the Kootenai River Valley, Idaho, are being made by Chas. E. Ramser, D. E.

Reports transmitted:

Murder Creek district, in Newton, Jasper and Putnam Counties, Ga., by J. V. Phillips, S. D. E.
Barbers Creek district, in Barrow and Oconee Counties, Ga., by J. V. Phillips, S. D. E.
Thickety Creek district, in Cherokee Co., S. C., by F. G. Eason, S. D. E.

Reports received:

McRae district, Telfair Co., Ga., by J. V. Phillips, S. D. E.
Columbia River bottoms, Marcus, Wash., by W. A. Kelly, D. E.

Swamp Lands.

Tests of a number of drainage pumping plants in south Louisiana have been made by W. B. Gregory, Coll., C. W. Okey, S. D. E., and Charles Kirschner, J. D. E., working together.

A thorough revision of Department Bulletin No. 71, The Wet Lands of Southern Louisiana, is being made by C. W. Okey, S. D. E., bringing the data and discussion up to date.

Reports received:

Storm Tides along the Central Gulf Coast, by C. W. Okey, S. D. E.
Reconnaissance Survey of Caw Caw and Scippio Swamps, in Brunswick Co., N. C., by H. M. Lynde, S. D. E.
Old State Road Swamps, Berkeley Co., S. C., by F. G. Eason, S. D. E.

Organization and Financing.

Investigations relating to administration and financing of drainage districts have been continued throughout September, by H. S. Yohe, expert, in Iowa, Minnesota, Wisconsin, and Illinois, and dealers in drainage bonds have been interviewed in Ohio, New York, and Baltimore.

Run-off.

Report transmitted:

Run-off in Bock and Jacob Swamp Drainage District, N. C., by A. D. Morehouse, D. E.

Peat, Turf, and Muck.

Report received:

Drainage of Muck Lands in Michigan, by J. R. Haswell, S. D. E.

ACCOUNTS SECTION

In order that the extent of the outstanding obligations of the office may be known as quickly as possible field men are requested to submit expense and other accounts without delay after the close of each month.

It is noted that many travelers do not show on stubs of transportation requests, the date of issuance, or cost of ticket. There is a space provided on the stub for this information and, as it is necessary in the accounting office, it is hoped that it will be furnished.

Canceled or spoiled requests should be forwarded promptly in order that your account may be given proper credit for unused requests.

Immediately upon the purchase of mileage or script, the report of purchase form 8-2902 should be promptly mailed to the Office.